

IN THE CLAIMS:

1 1.-29. (Cancelled)

1 30. (Currently Amended) A system for monitoring a household electric appliance being a
2 washing machine, the monitoring system comprising:

- 3 i. a read and write memory storing a plurality of measurements of a
4 plurality of physical quantities relating to the household electric
5 appliance within a predetermined time period during a treatment cycle,
6 the storing of a last measured value of a physical quantity causing the
7 deletion of a first measured value within said plurality of
8 measurements in the read and write memory;
- 9 ii. a first interface means to connect to one or more sensors for measuring
10 said plurality of physical quantities of the household electric appliance,
11 including one or more internal sensors for measuring internal physical
12 quantities and one or more external sensors for measuring external
13 physical quantities;
- 14 | iii. a dedicated communication network having a coupling to ~~an~~at least
15 | one of said external physical sensors, said network being coupled
16 | externally of the washing machine to the first interface means;
- 17 iv. a means for measuring at least one electric quantity by measuring an
18 electric current running through the monitoring device;
- 19 | v. a storage means containing one or more predefined values of ~~the~~at
20 | least one of said plurality of physical quantities;
- 21 | vi. a microcontroller to process a particular combination of ~~at least one~~
22 | said plurality of physical quantities and at least one electric quantity
23 | to determine an actual combination of the internal physical quantities,
24 | one or more external physical quantities or both and one ore more of
25 | said at least one electrical quantity ~~more electrical quantities~~ at an
26 instant in time, the microcontroller being further configured to

27 compare said actual combination to one or more respective predefined
28 values contained in the storage means to determine at least one piece
29 of information, each predefined value being a threshold value against
30 which an actual value is compared to determine a proper operation of a
31 particular component of the appliance at that instant in time;

32 vii. said microcontroller being further configured to adapt the operation of
33 the household appliance based upon data detected by said internal and
34 external sensors; and

35 vii-viii. a second interface means to send the at least one piece of information
36 to a remote center for storage.

1 31. (Currently Amended) The monitoring ~~device-system~~ as in claim 30, further
2 comprising:

3 a wireless communication device within the first interface means, the wireless
4 communication device communicating with at least one internal sensor within the
5 household electric appliance where the at least one internal sensor measures a physical
6 quantity of an internal part of the household electric appliance; said wireless
7 communication device also adapted to function as the dedicated communication network
8 that couples the external sensors that sense the external physical quantities to said first
9 interface means, and further to report electrical measurements; and

10 the microcontroller being adapted to further process the measurements received
11 from the wireless communication device.

1 32. (Cancelled)

1 33. (Currently Amended) The monitoring ~~device-system~~ of claim 30, further comprising:
2 a timing unit, where the timing unit determines time to be associated with the
3 measurements of the one or more physical quantities and at least one electric quantity.

1 | 34. (Currently Amended) The monitoring ~~device~~-system of claim 30, wherein the at least
2 | one electrical quantity includes at least one of: momentary electric current drawn by the
3 | household electric appliance, line voltage applied to the household electric appliance,
4 | momentary electric power drawn by the household electric appliance, electric energy
5 | consumption of the household electric appliance within a predefined time period, a power
6 | factor of the load represented by the household electric appliance, $\cos(\Phi)$ of the load
7 | represented by the household electric appliance, and type of reactive power of the load
8 | represented by the household electric appliance.

1 | 35. (Currently Amended) The monitoring ~~device~~-system of claim 30, wherein the first
2 | interface is connected to the one or more sensors through a wireless connection.

1 | 36. (Currently Amended) The monitoring ~~device~~-system of claim 30, wherein the
2 | second interface means is connected to the remote center through a wireless connection.

1 | 37. (Currently Amended) The monitoring ~~device~~-system of claim 41, wherein the
2 | household electric appliance includes one of: a clothes dryer, a washing/drying machine,
3 | a dishwasher, a refrigerator, a freezer, a refrigerator/freezer, an electric oven, a gas oven,
4 | a microwave oven, a gas cooking top, an electric cooking top, a magnetic induction
5 | cooking top, a kitchen hood, a conditioner, a gas boiler, an electric water heater, an air
6 | conditioner, a hair dryer, an iron, a Hi-Fi system, a mixer or any other electric
7 | kitchenware, a lighting device, an alarm device.

1 | 38. (Currently Amended) The monitoring ~~device~~-system of claim 30, wherein said at
2 | least one physical quantity includes at least one of: temperature, flow rate, conductivity,
3 | weight, absolute humidity, relative humidity, pressure, linear displacement, linear
4 | velocity, linear acceleration, angular displacement, angular velocity, angular acceleration,
5 | chemical concentration, sound pressure, sound intensity, light intensity, oscillation
6 | frequency, and oscillation amplitude.

39. (Currently Amended) The monitoring ~~device-system~~ of claim 30, further comprising:

an information storage means for storing the at least one piece of information in the read and write memory.

40. (Currently Amended) The monitoring ~~device-system~~ in claim 30, wherein the household electric appliance is one of a laundry washing machine and a washing/drying machine adapted to perform at least one wash treatment on textile items, said at least one physical quantity being preferably at least one of the following: weight of the textile items being present in the basket of the washing machine or the washing/drying machine, flow rate of water supplied to the washing machine or the washing/drying machine, temperature of washing liquid contained in a tub of the washing machine or the washing/drying machine, and conductivity of the washing liquid drained by the washing machine or the washing/drying machine, where the washing liquid comprises water and at least one washing agent.

41. (Currently Amended) A monitoring ~~device-system~~ for use with a household electric appliance, the monitoring ~~device-system~~ comprising:

i. a read and write memory storing a plurality of measurements of a plurality of internal physical quantities, a plurality of external physical quantities and a plurality of electrical quantities that are related to the household electric appliance, said measurements being taken within a predetermined time period during a treatment cycle, the storing of a last measurement of a physical quantity causing the deletion of a first measurement of said physical quantity;

ii. a first interface means to connect a dedicated external communications network to a plurality of external physical sensors, which measure one or more of said plurality of external physical quantities, and further having means for coupling a plurality of internal physical sensors for measuring one or more of a plurality of internal physical quantities~~an internal physical quantity of the household~~

16 | ~~electric appliance~~, where the one or more internal physical sensors are
17 | connected to the monitoring device by way of an electronic control
18 | means and the first interface means;

19 | iii. a means for measuring at least one electric quantity by measuring an
20 | electric current running through the monitoring device;

21 | iv. a microcontroller configured to:

22 | a) process measurements of a combination of one or more of said
23 | internal physical quantities, one or more external physical quantities, or
24 | both, and one or more electric quantities to determine at least one piece of
25 | information relating to or being employed in said treatment cycle during
26 | operation of the household electric appliance, where the at least one piece
27 | of information includes at least one of: functional information, statistical
28 | information, and diagnostic information relating to the household electric
29 | appliance by comparing a value of ~~said physical~~ at least one of physical
30 | internal quantity and at least one electrical quantity with one or more
31 | predefined values that relate to values for the treatment being performed
32 | by the appliance at an instant in time;

33 | b) drive an electronic control means which functions to adapt the
34 | operation of the household appliance based upon the data detected by the
35 | said external physical sensors and said internal physical sensors; and

36 | ~~b)c)~~ extrapolate from said plurality of measurements of said at least one
37 | physical quantity a data packet representative of the evolution of said at
38 | least one physical quantity within said predefined time period over one or
39 | more treatment cycles; and

40 | v. an information storage means for storing the at least one piece of
41 | information in the read and write memory.

1 | 42. (Currently Amended) The monitoring ~~device-system~~ of claim 41, wherein the first
2 | interface means is an electric cable to the one or more external sensors.

1 | 43. (Currently Amended) The monitoring ~~device-system~~ of claim 41, wherein the first
2 | interface means is wirelessly connected to the communication means.

1 | 44. (Currently Amended) The monitoring ~~device-system~~ of claim 41, wherein the first
2 | interface means is wirelessly connected to the one or more external sensors.

1 | 45. (Currently Amended) The monitoring ~~device-system~~ of claim 41, wherein the first
2 | interface means is connected to the first communication means.

1 | 46. (Currently Amended) The monitoring ~~device-system~~ of claim 41, wherein the
2 | communication means and the one or more internal sensors are connected through an
3 | electronic control means, where the electronic control means collects, stores, and
4 | processes the measurements from the at least one physical quantity from the one or more
5 | internal sensors.

1 | 47. (Currently Amended) A system for monitoring a household electric appliance, the
2 | system comprising:

3 | a) a household electric appliance;

4 | b) one or more external physical sensors to measure a plurality of external
5 | physical quantities of the household electric appliance; a dedicated
6 | communications network that is coupled to said external physical sensors
7 | and is connected externally from said appliance to said network which
8 | transfers information to an associated microcontroller via ~~the~~ a first
9 | interface means;

10 | an electronic control means connected to one or more internal sensors,
11 | where the one or more internal sensors measure one or more physical internal
12 | quantities, or external sensors measuring one or more electrical quantities of
13 | the household electric appliance, the electronic control means configured to
14 | collect, store, and process measurements of the one or more physical and
15 | electrical internal quantities being internal measurements;

a communication means communicating with the electronic control means to transfer one or more of said internal measurements, over a predetermined time period to a first interface means on a monitoring device;

c) the monitoring device including:

a. a read and write memory storing a plurality of measurements of said plurality of external physical quantities, a plurality of internal physical quantities and a plurality of electrical quantities, within a predetermined time period, the storing of a last measurement of said at least one quantity causing the deletion of a first measurement of said quantity;

b. the first interface means to connect to the one or more external sensors and ~~the said dedicated communication means network~~ to receive the measurements of the one or more of said plurality of physical external quantities and the one or more physical internal quantities;

c. a means for measuring at least one electric quantity by measuring an electric current running through the monitoring device;

d. a timing unit to associate an instant in time at which the measurements of the one or more physical quantities and the at least one electric quantity are taken,

e. a microcontroller configured to:

(i) process the measurements of the one or more physical external quantities with one or more physical internal quantities, and the at least one electric quantity, at the instant in time, to determine sensed information relating to the household electric appliance, where the sensed information includes: functional information, statistical information, and diagnostic information relating to the household electric appliance, said sensed information being a combination of values of at least one physical external quantity, physical internal quantity and at least one electric quantity with a

reference combination of physical and electrical quantities
being the combination that best represents the proper
operation of the appliance at that instant in time, and to
provide an electronic control means which functions to adapt
the operation of the household appliance based upon the data
detected by the sensors;

- (ii) collect information that allows the system to trace a history
of the monitored electric appliance that permits the
microprocessor to build in the read and write memory,
profiles being indicative of a trend within a predefined time
period of a particular physical quantity or typology of
information obtained by the microcontroller based upon
values detected by ~~the~~ said internal and external sensors; and
- f. a second interface means to send the at least one piece of information
to a remote center; and
- g. the remote center configured to collect the at least one piece of
information from one or more monitoring devices connected to respective
household electric appliances and to extract statistical information about
the household electric appliances being monitored.

48. (Previously Presented) The system of claim 47, wherein the remote center receives a
plurality of information sent by the monitoring device that the remote center collects and
sorts for the purpose of identifying at least one parameter related to the operation of a
washing machine or a washing/drying machine, the at least one parameter being
preferably at least one of the following: number of wash treatments performed by the
washing machine or the washing/drying machine within a predefined time interval,
quantity and typology of textile items loaded on average by a user for each wash
treatment, quantity and typology of washing agents loaded on average by the user for
each wash treatment, average quantity of water used by the washing machine or the
washing/drying machine for each wash treatment, and average electric energy absorbed

11 by the washing machine or the washing/drying machine for each wash treatment.

1 49. (Cancelled)

1 50. (Currently Amended) The system as defined in claim 30 further comprising: wherein
2 ~~the external sensors include further comprising~~

3 _____ the external sensors having:

4 a flow sensor positioned along an associated inlet pipe and adapted to measure
5 water flow rate supplied to the washing machine; and

6 a conductivity sensor positioned along a drain pipe adapted to measure the
7 conductivity of washing liquid drained from the washing machine.

1 51. (Currently Amended) A system for monitoring a washing machine, comprising

2 a microcontroller configured to receive measurements from sensors associated
3 with the washing machine;

4 a flow sensor positioned along an associated inlet pipe externally to said washing
5 machine and adapted to measure water flow rate supplied to the washing machine;

6 a conductivity sensor positioned along a drain pipe adapted to measure the
7 conductivity of washing liquid as the liquid drains from the washing machine;

8 a dedicated communication network having a coupling to the flow sensor
9 and the conductivity sensor, said network being coupled externally of the
10 washing machine to the microcontroller; ~~and~~

11 said microcontroller being further configured to adapt the operation of the
12 household appliance based upon data detected by said flow sensor and said conductivity
13 sensor; and

a read and write memory storing a plurality of measurements of at least one
physical quantity relating to the washing machine's operation, to provide a historical
analysis of the operation of the washing machine.